



# National Fenestration Rating Council Incorporated

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NFRC Simulation Reporting Requirements

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## ***FOREWORD***

The National Fenestration Rating Council has developed a uniform national rating system for energy performance characteristics of fenestration products.

The NFRC 100, NFRC 200, NFRC 303, NFRC 304, and NFRC 500 are procedures developed by the National Fenestration Rating Council (NFRC) to meet the need for a uniform and accurate means for thermal and related performance ratings of fenestration systems. These procedures use state-of-the-art computer simulation software tools, with periodically updated optical properties and physical hotbox testing. The performance ratings established by these procedures are determined at a fixed set of environmental conditions. Consequently, the performance ratings determined using these procedures may not be appropriate for directly determining seasonal energy performance.

Ratings per these procedures are based on computer simulations. A physical test on a representative specimen is used to validate product conformance and the computer simulations. Products that cannot be simulated use ratings based on physical testing.

This document is a supplemental document to the procedures regarding the reporting requirements providing total product ratings for NFRC 100 U-Factor, NFRC 200 Solar Heat Gain Coefficient and Visible Transmittance and NFRC 500 Condensation Resistance.

Each testing laboratory shall issue a test report to the fenestration product manufacturer for whom NFRC testing was conducted and, upon approval from the manufacturer, shall issue the same report to the manufacturer's IA.

In issuing reports for use in connection with the Certification Program, an NFRC-accredited simulation laboratory shall comply with the NFRC Rating Procedure applicable to the energy performance characteristic to be rated. See Glossary for the definition of Rating Procedure.

Questions on the use of this procedure should be addressed to:

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# 1. MANDATORY REPORTING REQUIREMENTS FOR SIMULATION LABORATORIES

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## 1.1 Simulation Laboratory Reporting Requirements for NFRC 100, NFRC 200, NFRC 303, NFRC 304, and NFRC 500

NOTE: For products seeking certification in accordance with the requirements set forth in the NFRC 705 - Component Modeling Approach (CMA) refer to Section 1.1.2.

### 1.1.1 Reporting Requirements for NFRC 700 - Product Certification Program

Laboratories shall issue a unique simulation report for each distinct Product Line and/or product type as defined in NFRC 100. The report shall be issued to the fenestration product manufacturer for whom the NFRC simulation was conducted.

- A. The simulation report and the representative electronic upload data spreadsheet shall identify one distinct product line represented by one upload matrix with a unique report number.
- B. Upon approval from the manufacturer (via written letter or electronic documentation), the same report shall be issued to the manufacturer's IA. The approval shall be included in the simulation folder or report.
- C. The simulation laboratory shall include in the report the drawings and bill of materials supplied by the manufacturer
- D. The package of extrusion drawings, bill of materials, and assembly drawings shall be authenticated by the simulation laboratory. The Authentication shall be indicated by the laboratory stamp bearing the unique simulation report number. The simulation laboratory shall stamp the bill of materials and individual drawings to indicate that they are representative of the materials and profiles used in modeling the product.

The simulation report shall include the following:

- E. Name, address and phone number of the laboratory
- F. Simulation date
- G. Name and address of the client

- H. Serial number, report number or other appropriate means of identifying each individual product line report
- I. A statement that the simulations were conducted in full compliance with NFRC requirements
- J. NFRC Procedures and the editions under which the report was submitted (i.e. NFRC 100-2004)
- K. Drawing(s) and a detailed written description of the specimen including (where applicable):
  - i. Manufacturer and model number
  - ii. General description of product (i.e., operator type, size, framing type, glazing type, spacer type)
  - iii. Assembly, bill of materials and parts drawings (i.e., frame, sash, glazing, hardware, etc.); including frame sections and part drawings with dimensions
  - iv. Individual product glazing characteristics (i.e. thickness, coatings, emissivities and surfaces, tints, etc.)
    - a) A detailed description of any glass layer created in accordance with NFRC 303 and NFRC 304 to include the applicable information: glass, film, laminate, and interlayer.
    - b) Air space characteristics including gap width, gas fill, gas type, design and/or measured gas concentration and filling technique
    - c) Spacers – materials and construction, as identified with a dimensioned drawing placement with respect to the glazing system.
    - d) Grilles – materials, placement and pattern, if different from the default pattern in the currently approved software
    - e) Materials used for framing, sash, edge window construction, weather-stripping (types and locations) and finish
    - f) All continuous hardware included in the models

- g) Solar absorbance of dividers and frames used for simulation if other than the default values. Deemed to be satisfied by inclusion in the NFRC Upload spreadsheet
- L. Simulation results (where applicable), including:
- i. Frame "heights" as defined in the most current version of the NFRC Simulation manual
  - ii. Calculated areas for frame, edge-of-glazing, center-of-glazing, divider, edge-of-divider, door core, lite-frame, edge-of-lite, center-of-lite, panel and edge-of-panel
  - iii. Area-weighted total fenestration product U-factor
    - a) Calculated U-factors for frame, edge-of-glazing, center-of-glazing, divider, edge-of-divider; door core, lite-frame, edge-of-lite, center-of-lite, panel, and edge-of-panel (unless not applicable) and may be submitted using data files.
  - iv. Area-weighted total fenestration product solar heat gain coefficient (SHGC)
  - v. Center-of-glazing solar heat gain coefficient (SHGC<sub>cog</sub>)
  - vi. Area-weighted total fenestration product Visible Transmittance (VT)
  - vii. Center-of-glazing visible transmittance (VT<sub>cog</sub>)
  - viii. Individual spacer models (if applicable)
  - ix. Material thermal and optical property values other than the default values listed in the programs used for the simulations
  - x. Any changes to default boundary conditions
  - xi. Groupings details (if applicable)
  - xii. Reference product used in attachment simulation (if applicable)

[**Note:** Items listed in “i” through “vii” are deemed to be satisfied by submitting simulation and data files from the currently approved NFRC simulation programs unless the simulation area weighting is not done with NFRC approved software.]

- M. All NFRC-approved software data files and calculations used in simulation on diskette, CD or electronic format

- N. Any additional comments or data deemed important in the understanding or review of the report (e.g., any modeling assumptions)
- O. Description of the product(s) meeting the validation criteria and the simulated results for those product(s) based on the actual specimen size (if different from the standard NFRC sizes). This requirement is satisfied by submission of the NFRC upload spreadsheet.
- P. Identification of each individual product within a Product Line, as defined for NFRC Certification. This requirement is satisfied by submission of the NFRC upload spreadsheet
- Q. Name and signature of the individual performing the simulations.
- R. Name and signature of simulator-in-responsible-charge accepting the responsibility for the technical accuracy of a simulation report.
- S. A statement that the report shall not be reproduced, except in full, without the approval of the laboratory.
- T. A statement that the report relates only to the fenestration products simulated.
- U. A statement that rounding is per NFRC 601, *NFRC Unit and Measurement Policy*.
- V. Any report that is revised or updated after the initial issue date of the original report for submission to an IA shall have any and all revisions properly identified in the report. Acceptable methods to identify revisions are, but not limited to the following: bold; highlight; note section; tracking form; or a numbering system. The report shall also include the initial report date, revised report date, and identification in the title that the report is revised, and any updated drawing(s) or information.
- W. The NFRC required U-Factor, SHGC, VT, Condensation Resistance matrices and/or summary report requirement is deemed to be satisfied by uploading the currently approved Upload Spreadsheet. A hard copy of the matrix is not required.

- X. A table of the 0 and 1 Solar Heat Gain Coefficient and Visible Transmission SHGC/VT 0 & 1 values for no dividers, dividers < 25.4mm (1”) and dividers  $\geq$  25.4mm (1”). This requirement is satisfied by submission of the NFRC upload spreadsheet. This does not apply to attachment products.
- Y. The following statement shall be included in the report:  
“Ratings values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values identified on a valid Certification Authorization Report (CAR) by an NFRC accredited Inspection Agency (IA) are to be used for labeling purposes.”
- Z. If Condensation Resistance is calculated and reported, then the following statement shall be included in the report: “The Condensation Resistance results obtained from this procedure are for controlled laboratory conditions and do not include the effects of air movement through the specimen, solar radiation, and the thermal bridging that may occur due to the specific design and construction of the fenestration system opening.”
- AA. NFRC simulation laboratories shall, as part of the simulation report, upload the *NFRC Upload Spreadsheet* to the NFRC database. The values in the *NFRC Upload Spreadsheet* shall be consistent with any values reported in the submitted NFRC simulation test report. The *NFRC Upload Spreadsheet* must be in MS Excel<sup>®</sup> format and values must not be linked to other workbooks.
- BB. If the report, in its entirety, is submitted in electronic format, it shall include and comply with all the requirements of a written report. Electronic reports shall be password protected to prevent unauthorized modification. Reports prepared in this manner shall be considered equal substitutes to printed (hard) copies. If the electronic file format venue is used, the laboratory shall be responsible for maintaining a back-up copy.

### **1.1.2 Reporting Requirements for NFRC 705 - Component Modeling Approach (CMA) Product Certification Program**

These reporting requirements are for compliance with the CMA Program referencing Section 5.6 of NFRC 100 and Section 5.6 of NFRC 200.

Upon approval from the component manufacturer (via written letter or electronic documentation), the same report shall be issued to the manufacturer's IA. The approval shall be included in the simulation folder or report.

The CMA report shall include the following:

- A. Name, address and phone number of the laboratory
- B. Simulation date
- C. Name and address of the client
- D. Serial number, report number or other appropriate means of identifying the report
- E. A statement that the simulations were conducted in full compliance with NFRC requirements
- F. NFRC simulation laboratories shall, as part of the simulation report, send separately the component data configured in CMAST to the CMAST web server for acceptance by an NFRC licensed IA, and include the following in the simulation report:
  - i. CMAST Server ID and corresponding component name of each component (frame or spacer) modeled in THERM and imported into CMAST.
  - ii. CMAST Server ID and U-Factor of the validation option configured in CMAST
  - iii. CMAST Server ID of any built laminate or applied film glass layer option imported from Optics.
- G. Identification of the spacer component approval path, Path II or III. (Path II shall identify seal configuration as either single-seal or dual-seal)
- H. NFRC Procedures and the editions under which the report was submitted (i.e. NFRC 100-2004)

- I. Detailed written description of the component(s) including (where applicable):
  - i. Manufacturer
  - ii. Framing Product Line name of frame component(s)
  - iii. Series name of spacer component(s)
  - iv. Groupings details (if applicable)
  - v. Authenticated parts drawings, with the following information included on the drawing(s): Dimensions, Material, and Finish.
  - vi. The Authentication shall be indicated by the laboratory stamp bearing the unique simulation report number. The simulation laboratory shall stamp the bill of materials and individual drawings to indicate that they are representative of the materials and profiles used in modeling the product.
- J. A detailed description of any glass layer created in accordance with NFRC 303 and NFRC 304 to include the applicable information: glass, film, laminate, and interlayer.
- K. Spacers – materials and sealant(s), as identified with a dimensioned and authenticated drawing (See 1.1.2.I.v for authentication of drawings).
- L. Simulation results (where applicable):
  - i. For Frame Component(s) approvals:
    - a) Frame height(s), or the Projected Frame Dimension (PFD) of each component submitted
    - b)  $U_f$  and  $U_e$  of each frame component from the THERM runs for the results of the Low Glazing with Low Spacer (L/L), Low Glazing with High Spacer (L/H), High Glazing with Low Spacer (H/L), and High Glazing with High Spacer (H/H).
  - ii. For Spacer Component approvals:
    - a) Spacer heights,
    - b) Spacer widths,
    - c) Spacer conductivity ( $k_{eff}$ )

- iii. For built laminates and applied films in Optics5 for determination of optical properties, the calculated values of  $T_{sol}$ ,  $R_{sol1}$ ,  $R_{sol2}$ ,  $T_{vis}$ ,  $R_{vis1}$ ,  $R_{vis2}$ ,  $T_{ir}$ ,  $emiss_1$ , and  $emiss_2$ .
- iv. Calculated U-factors for frame, edge-of-glazing, center-of-glazing, panel, and edge-of-panel (unless not applicable).
- v. Material thermal conductivity property values other than the default values listed in the programs or NFRC 101 used for the simulations

[**Note:** Reporting requirements for items M.i through M.v are deemed to be satisfied when submitting the component data for approval to the CMAST web server]

- M. All NFRC-approved software data files and calculations used in simulation on diskette, CD or electronic format
- N. Any additional comments or data deemed important in the understanding or review of the report (e.g., any modeling assumptions)
- O. Description of the product meeting the validation criteria and the simulated results for those product(s) based on the actual specimen size (if different from the standard NFRC sizes). This reporting requirement is satisfied by submission of the NFRC upload spreadsheet.
- P. Name and signature of the individual performing the simulations.
- Q. Name and signature of simulator-in-responsible-charge accepting the responsibility for the technical accuracy of a simulation report.
- R. A statement that the report relates only to the fenestration component(s) simulated.
- S. A statement that rounding is per NFRC 601, *NFRC Unit and Measurement Policy*.
- T. Any report that is revised or updated after the initial issue date of the original report for submission to an IA shall have any and all revisions properly identified in the report. Acceptable methods to identify revisions are, but not limited to the following: bold; highlight; note section; tracking form; or a numbering system. The report shall also include the initial

report date, revised report date, and identification in the title that the report is revised, and any updated drawing(s) or information.

- U. The following statement shall be included in the report:  
“Component values included in this report are for submittals to an NFRC-licensed IA and are not meant to be used directly for labeling purposes. Only those values approved and identified on a valid CMA Label Certificate are to be used for labeling purposes.”
  
- V. If the report, in its entirety, is submitted in electronic format, it shall include and comply with all the requirements of a written report. Electronic reports shall be password protected to prevent unauthorized modification. Reports prepared in this manner shall be considered equal substitutes to printed (hard) copies. If the electronic file format venue is used, the laboratory shall be responsible for maintaining a back-up copy.